

Diverse Engineering Careers in Astronautics & Human Space Exploration



James R. Stoffel

Extravehicular Activity (EVA) Flight

Operations Engineer & Astronaut Instructor

Former: Mechanical Propulsion Engineer &

Emergency Medical Services

MS Space Studies (2020), BSAAE, BS Physics





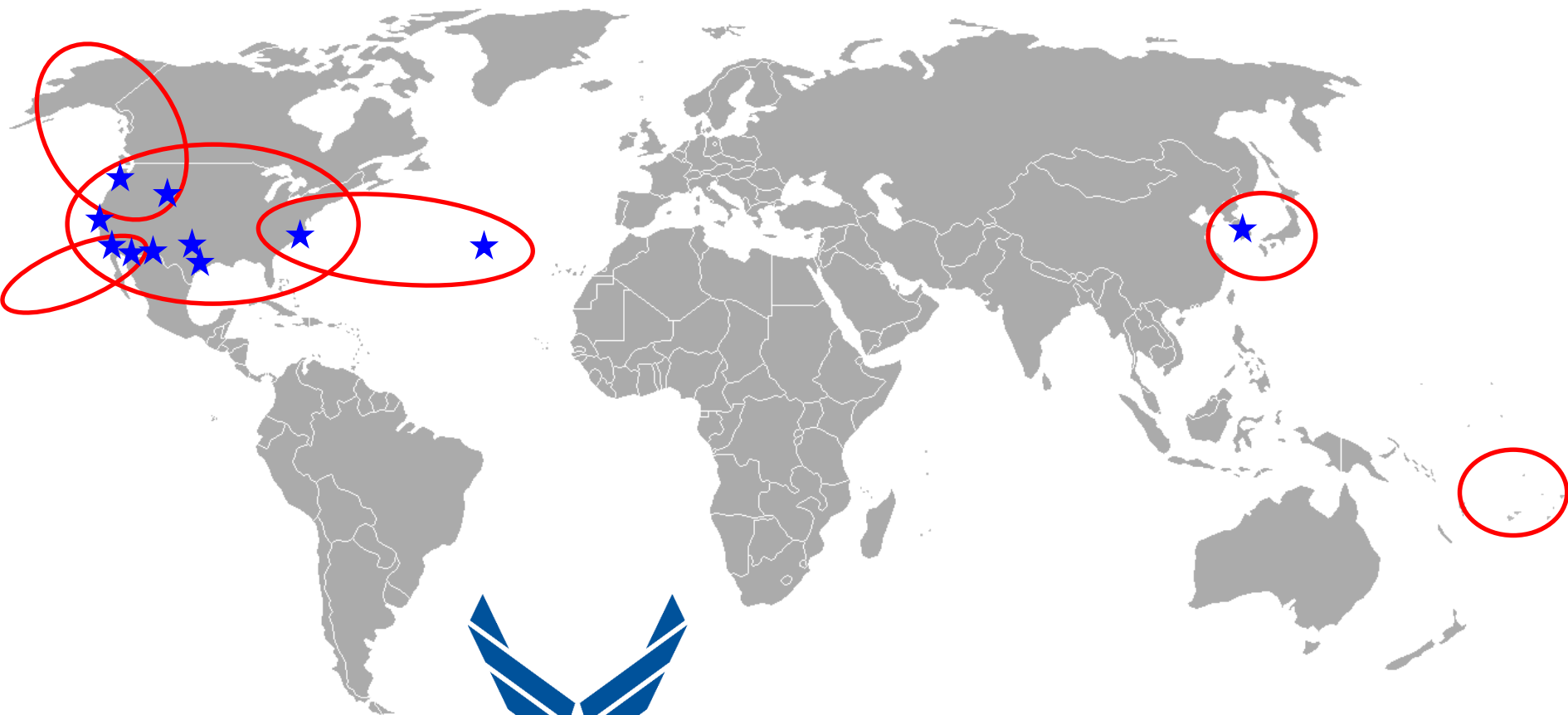
Goals

“To tap the imagination of the world and contribute innovative, safer, and affordable space systems and operations through imagination, exploration, engineering, teamwork, and leadership.”

*“Facilitate all of our hard work to life on and off this **Pale Blue Dot** we call home.”*



Who Am I?

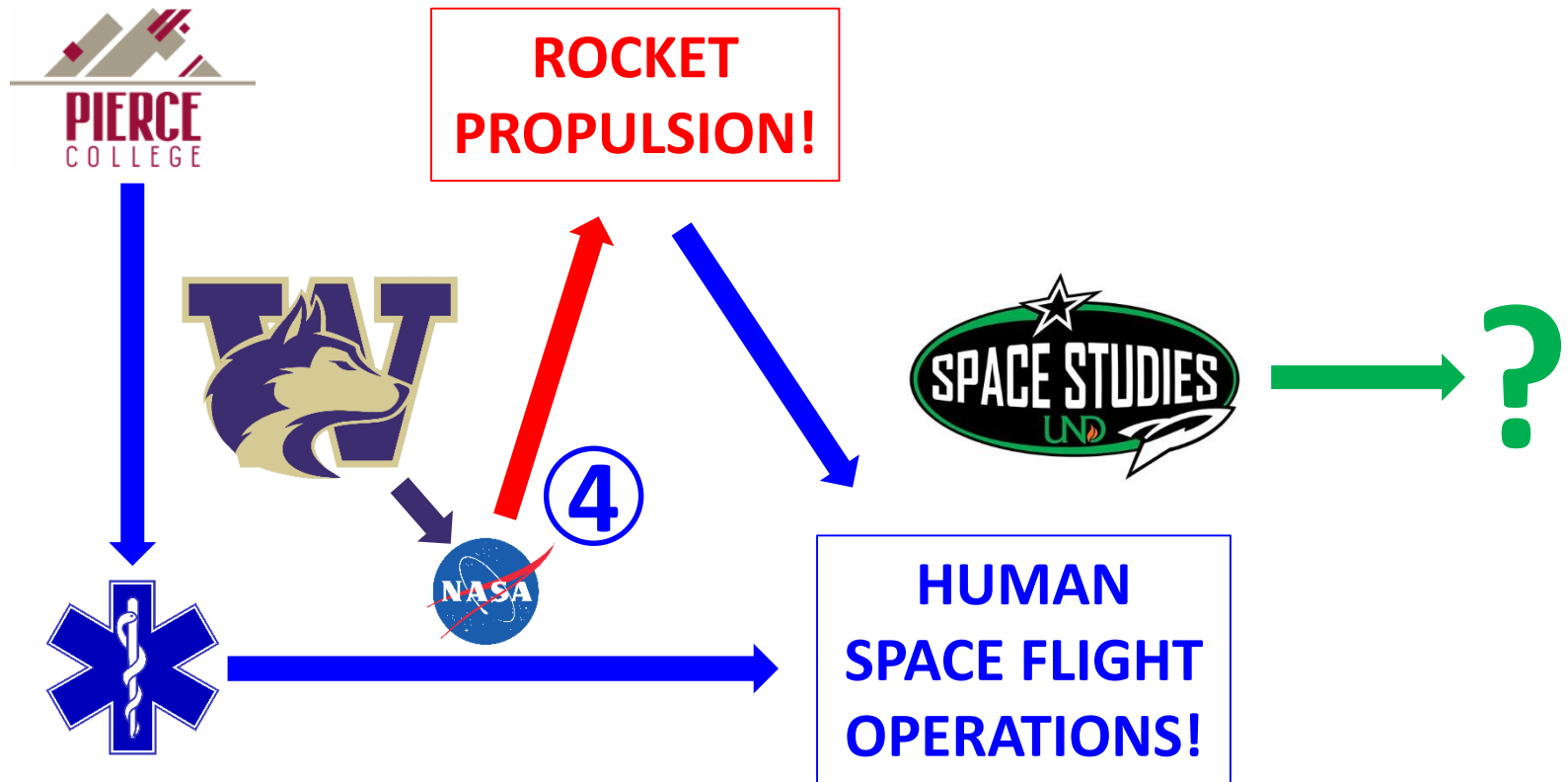


U.S. AIR FORCE

DIVERSE ENVIRONMENTS



Education & Careers



NETWORKING!

1993

2000-2008

2008-2014

2015-CURRENT

FUTURE



Safety

I've been saving lives for over a decade. I worked in a medical lab, on an ambulance, and in the emergency room where I was exposed to how fragile and resilient life is. My duties required attention to detail of composure, aptitude, and stress management to perform on a dime for any given moment. My experiences has reinforced the importance of safety in every aspect of my daily life...



**Rural/Metro Ambulance
Pacific Northwest Region**





Independent & Undergraduate Work

Aerospike Nozzle

"Experimental and Theoretical Investigation of Aerospike Nozzles in a Hybrid Rocket Propulsion System" AIAA-2009-0219



Lab-scale Hybrid Rocket

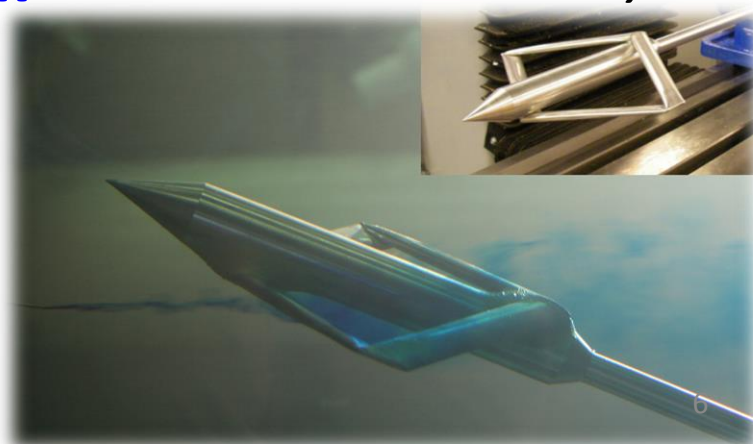
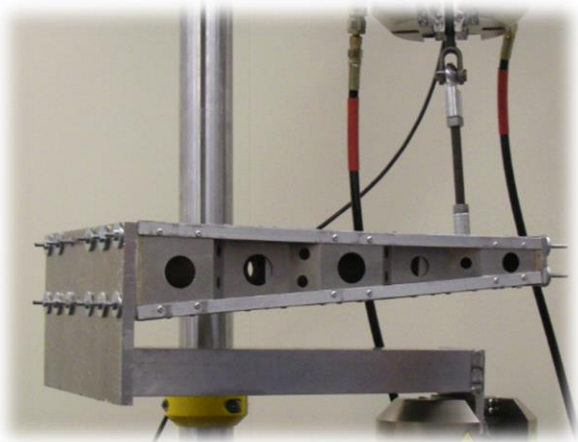
NASA Revolutionary Aerospace Systems Concepts Academic Linkage: "Lunar South Pole Exploration and Reconnaissance"



*Wingbox Design
Competition*

**TEAMWORK &
LEADERSHIP**

*Joined-wing Aircraft
Water Tunnel Study*





Space Propulsion Programs



SNC's Dream Chaser



SpaceShipTwo

GALACTIC



**Advanced Research Concept
Hybrid Experimental Rocket**

(Launch Vehicle)





Mechanical Propulsion Engineer

- Flight Hardware
- Mfg. & Tooling
- Ground Support Equip.
- Test Facilities
 - Design
 - Analysis
 - Procurement
 - Fabrication
 - Integration
 - Testing

WIRED

GEAR SCIENCE ENTERTAINMENT BUSINESS SECURITY DESIGN OPINION

Behind the Scenes of SpaceShipTwo's First Powered Flight



REF: <https://www.wired.com/2013/04/spaceshiptwo-powered-flight/>

TEAMWORK!!!



Test Site Design, Integration, & testing



Photo Courtesy: Spacedev and Sierra Nevada Corporation Archived Media Articles Released



REF: http://mediakit.sncorp.com/mediastore/slideshows/rotation_6.jpg



Flight Ops & Space Exploration

- Astronaut Instructor
- Flight Controller in Training
- Diver
- Human Test Subject

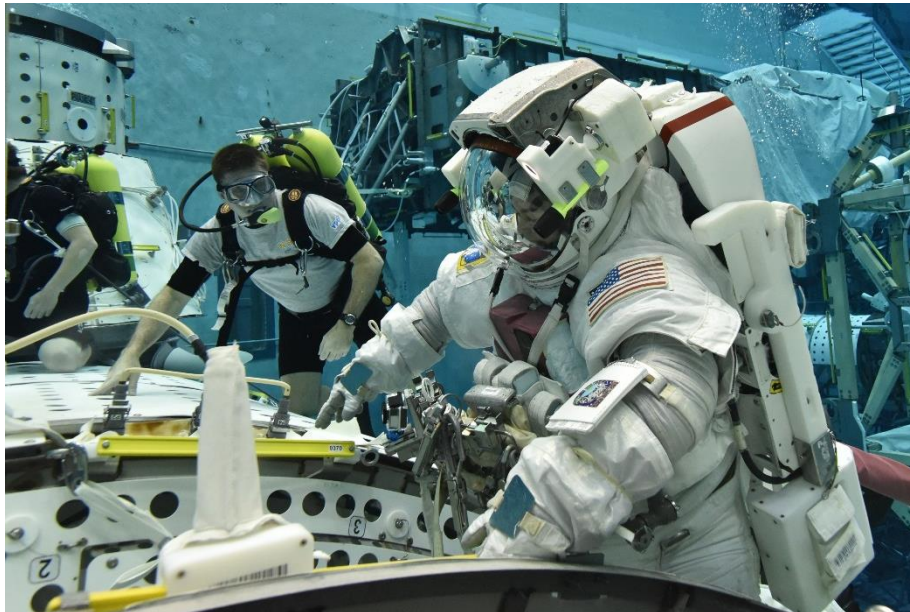


Photo Courtesy NBL: Suited Subject Suit Qual (Presenter: James Stoffel)



Mark T. Vande Hei 
@Astro_Sabot



Following

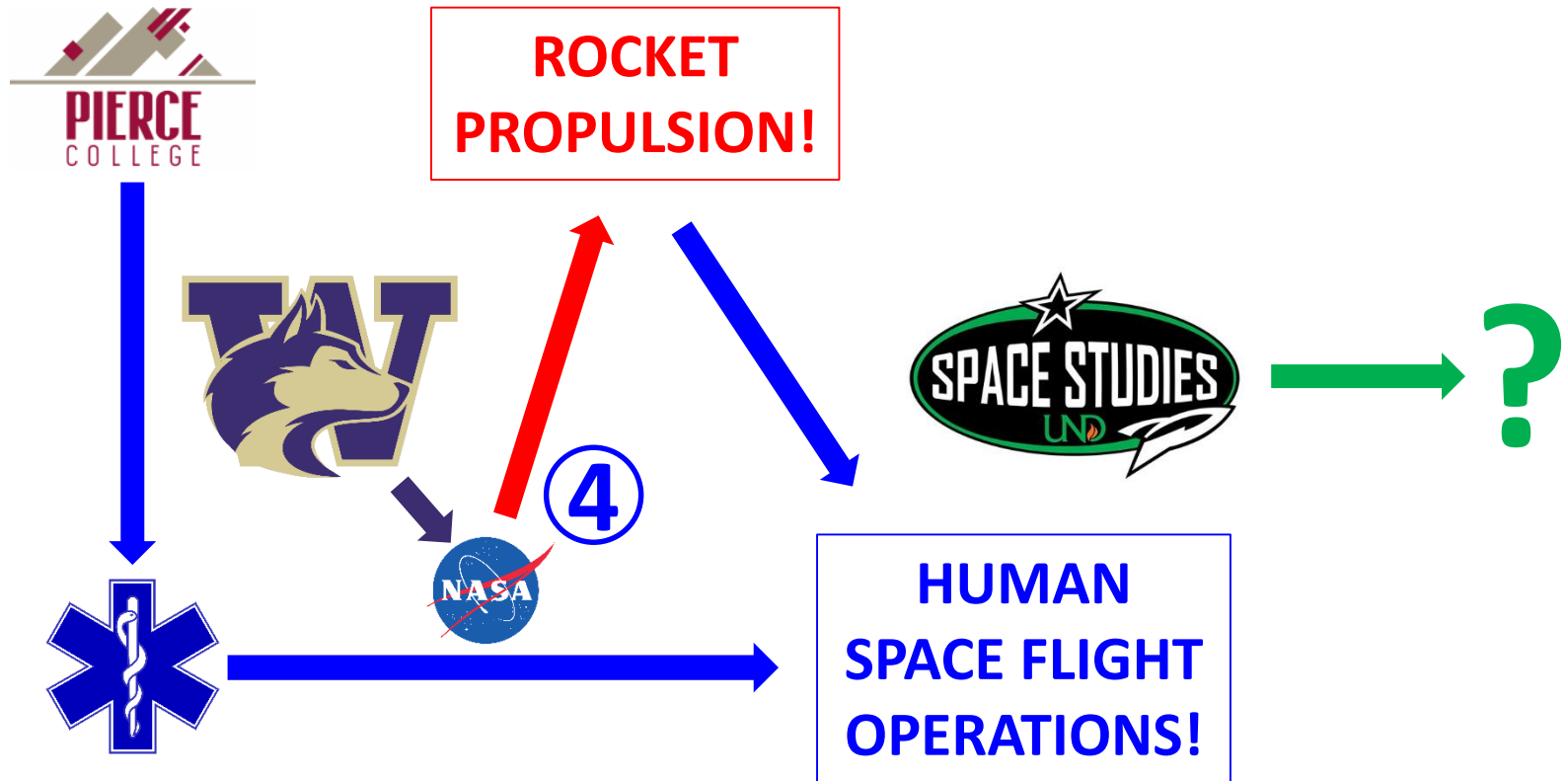
Learning the procedures for last Monday's NBL run. The details matter! w Dino, Mader, @4space_cowboy, & @Astrollini



REF: https://twitter.com/Astro_Sabot/status/639143119381004288



Education & Careers



NETWORKING!

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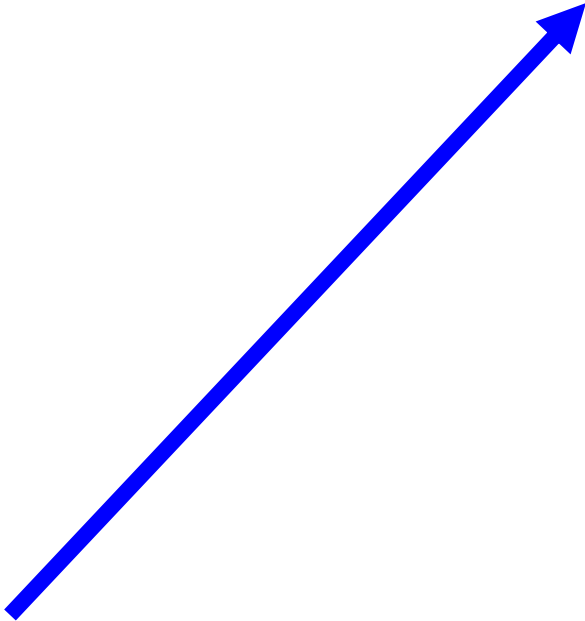
2015-CURRENT

FUTURE



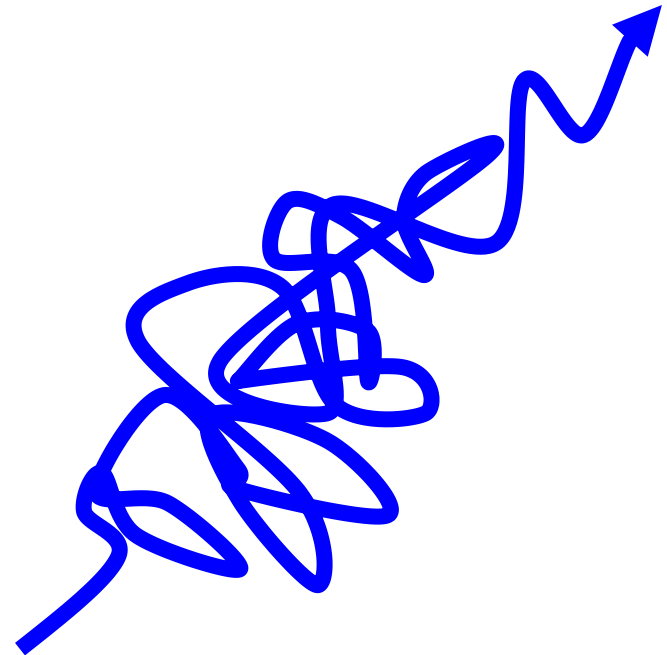
Path to Success

SUCCESS



What People think it looks like

SUCCESS



What it really looks like



Failure & Success

- It's okay to **FAIL**...
 - As long as you ***#NeverGiveUp !!!***
- Failure are experiences... **LESSONS LEARNED**
- Eventually... You become a:

SUBJECT MATTER EXPERT (SME)

Or as we say at **NASA**:

“Schmeeee”



Generalist vs Specialist

Generalist

- Definition?
 - A person competent in several different fields or activities.
- Example?
 - LV Systems Engineer
- Pro's & Con's?
- Ideal generalist?
 - Specializing-Generalist

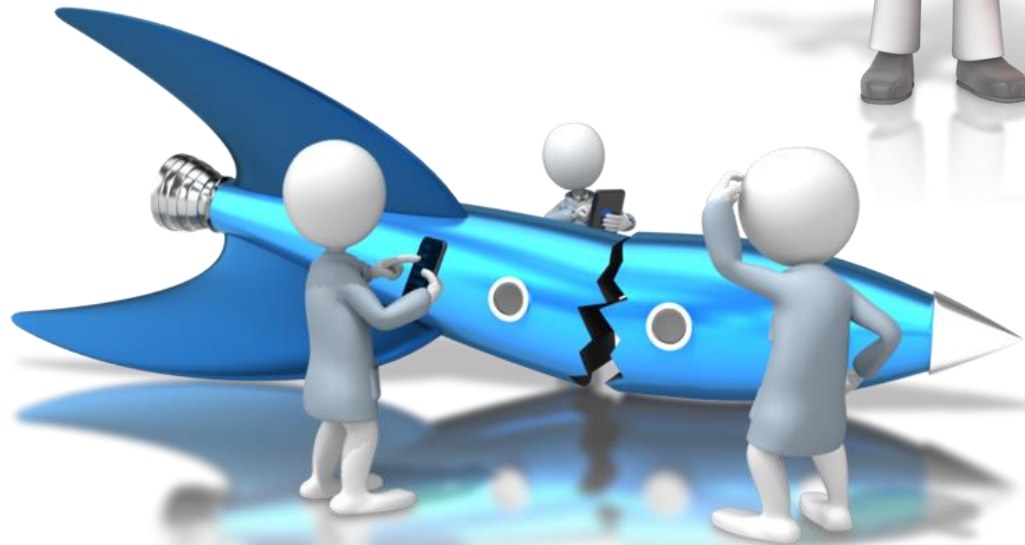
Specialist

- Definition?
 - A person who concentrates primarily on a particular subject or activity; a person highly skilled in a specific and restricted field.
- Example?
 - Rocket Turbine Engineer
- Pro's & Con's?
- Ideal specialist?
 - Generalizing-Specialist



Jack of All Trades...

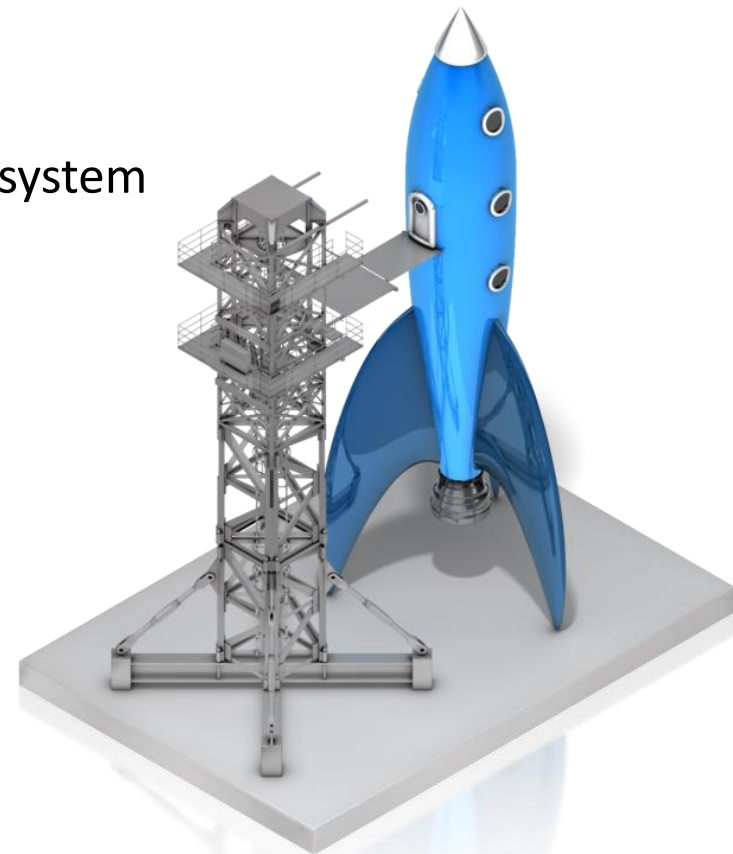
- Jack of All Trades
- Jack of All Trades, Master of None...
- Jack of All Trades, Master of One...
- Jack of All Trades, Master of Some...





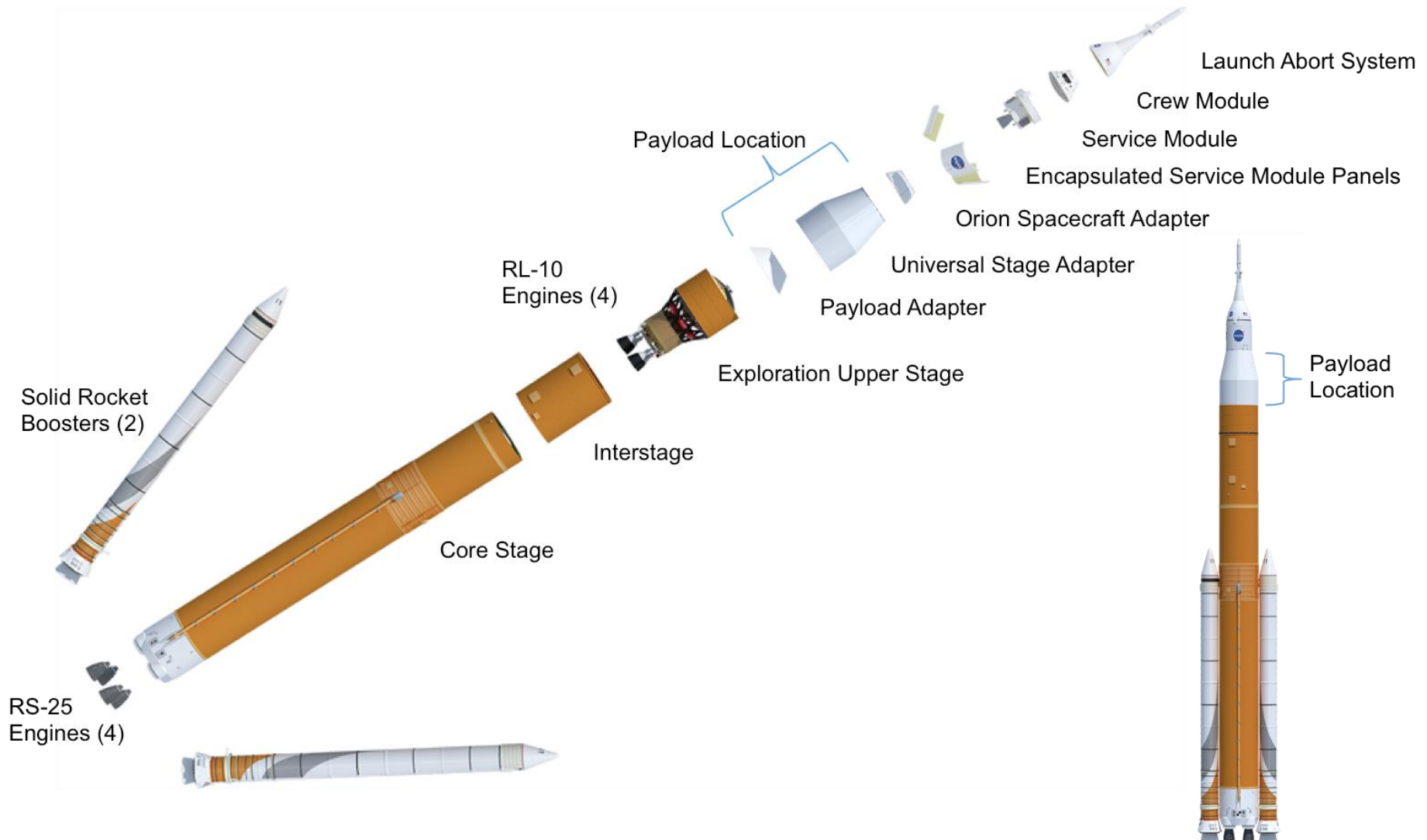
Example SLS

- **List at least 4 examples or elements that function together to produce the capability to meet a need?**
 - **Example: Space Launch System**
 - Propulsion Subsystem
 - Navigation, Guidance, and Control Subsystem
 - Communication and Data Handling
 - Electrical Power
 - Structure and Mechanisms
 - Staging
 - Ground Support Equipment
 - Facilities
 - Mission Control





Example SLS



REF: <https://www.nasa.gov/feature/nasa-seeks-payload-concepts-for-second-sls-test-flight>



Multiple Points of View

- Appreciate & understand **Multiple Points of View**
 - Customer
 - Manager & Administration
 - Other Subsystem Engineers
 - Technicians
 - Welders
 - Fabricators
 - Integrators
 - Ops



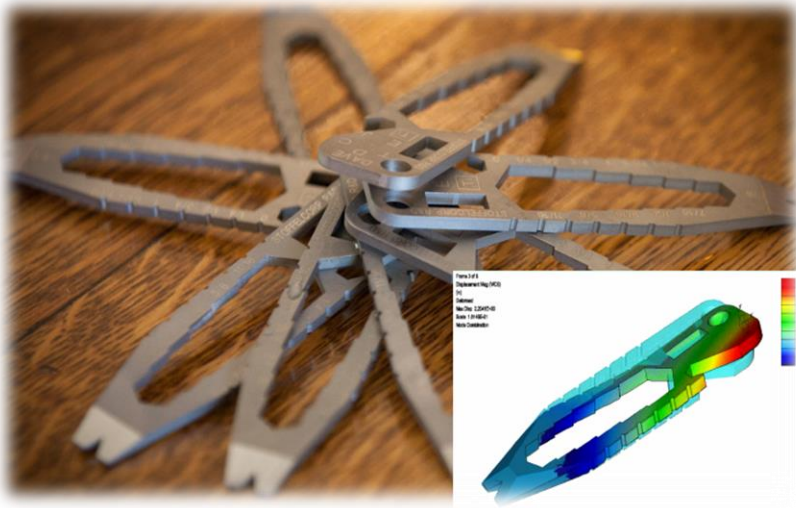
How to Diversify

- **Give 2 examples on how one can diversify their engineering career portfolio/paths?**
 - Take on new challenges/opportunities at your current employment
 - Dual & Continuing Education
 - Extracurricular activities



Engineering for Fun

Groomsmen Custom Titanium Multi-tool



3D Printed Thor's Hammer Baby Rattle



*N2O/C3H8 Biprop Torch Igniter
(3D Printed)*



Water-jet Aluminum Welcome Home Sign





Engineering for Fun

Steampunk Retro Rocket for Our Son





Team Player, Adventurer, & Explorer

San Diego Outrigger Canoe Club



Flying



Backpacking Cascades



Diving Molokini Crater





Summary

- **SAFETY, TEAMWORK, & LEADERSHIP**
- **Networking** in ALL environments
- **FAILURE + #NeverGiveUp = Success & SME**
- Defining a **generalist & specialist** in engineering
- ***Jack of All Trades Master of Some (Many)***
- Appreciate/Understand **Multiple Points of View**
- Elements (**opportunities**) of a Space System
- **Multiple pathways** to having diverse engineering career paths



***Any Burning
QUESTIONS?!***

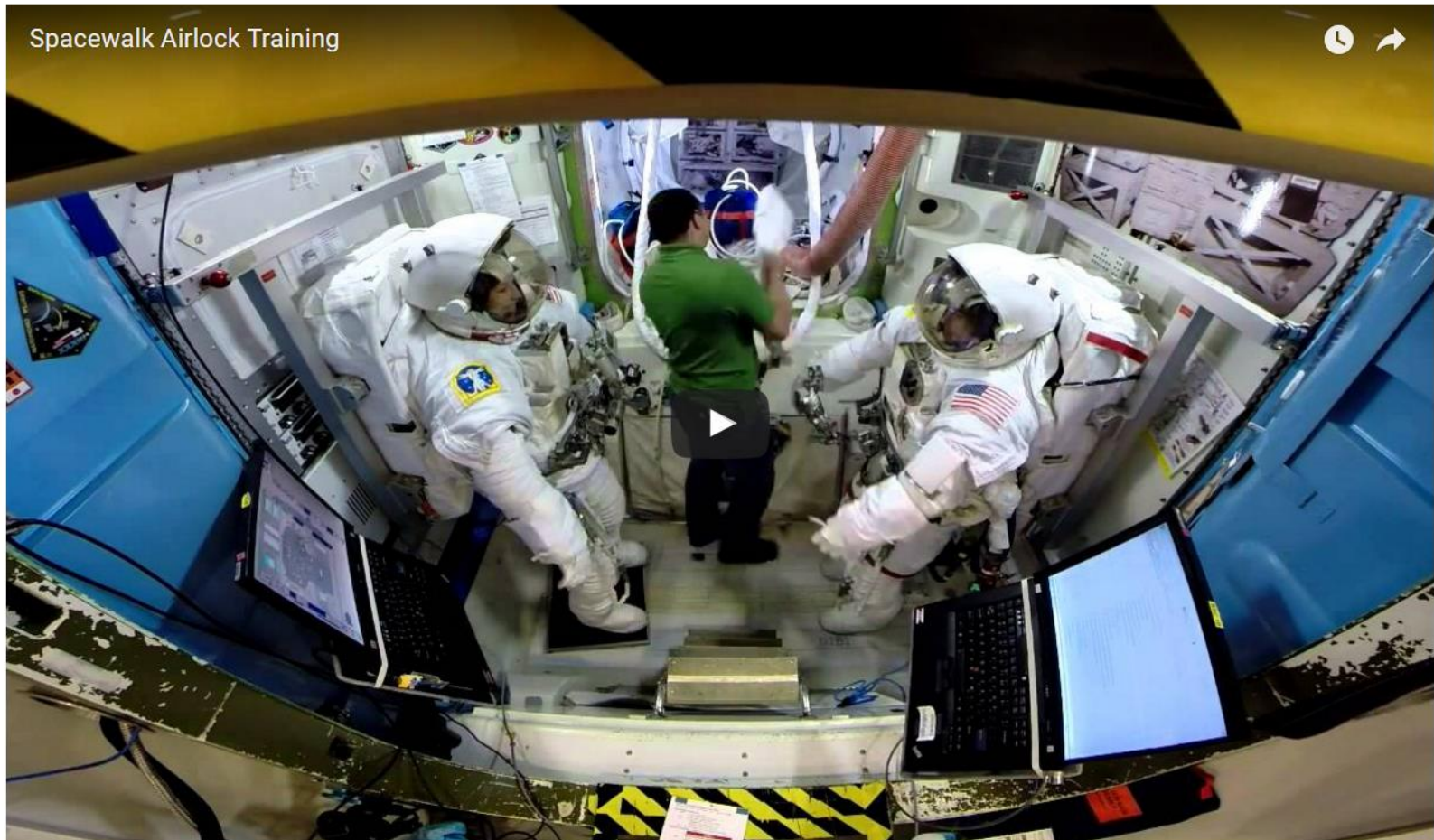




NASA – Suit Up

<https://www.nasa.gov/feature/spacewalk-airlock-training>

Spacewalk Airlock Training





Contact

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MS Space Studies (2020), BSAAE, BS Physics
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*“For once you have tasted flight you will walk the earth with
your eyes turned skywards, for there you have been and there
you will long to return.”*

- Leonardo da Vinci